U.S.ENVIRONMENTAL PROTECTION AGENCY NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY 540 S. MORRIS AVE., MONTGOMERY, AL 36115 RA226 ANALYSES

REPORT OF SAMPLE DELIVERY GROUP #1100245

Project:

Dimock Residential GW Site, Dimock, PA

Analysis method:

Radium-226 in Water: Rapid Method for High-Activity Samples

Report ID:

1100245-RA226

Report type:

Original 03/29/2012

Date reported: Total pages in report:

30

SAMPLES

NAREL Sample #	Client Sample ID	Location	Matrix	Date Collected	Date Received
B2,01332V	FB09	PA:DIMOCK	WATER-DRINKING	02/02/2012	02/03/2012
B2.01333W	HW42Z	PA:DIMOCK	WATER-DRINKING	02/02/2012	02/03/2012
B2.01455F	HW42	PA:DIMOCK	WATER-DRINKING	02/02/2012	02/03/2012
B2.01456G	HW46	PA:DIMOCK	WATER-DRINKING	02/02/2012	02/03/2012
B2.01457H	HW46-P	PA:DIMOCK	WATER-DRINKING	02/02/2012	02/03/2012
B2.01458J	FB08	PA:DIMOCK	WATER-DRINKING	02/01/2012	02/03/2012
B2.01459K	HW34A	PA:DIMOCK	WATER-DRINKING	02/01/2012	02/03/2012
B2.01460C	HW34A-P	PA:DIMOCK	WATER-DRINKING	02/01/2012	02/03/2012
B2.01461D	HW4I	PA:DIMOCK	WATER-DRINKING	02/02/2012	02/06/2012
B2.01462E	HW41-P	PA:DIMOCK	WATER-DRINKING	02/02/2012	02/06/2012
B2.01463F	HW28A	PA;DIMOCK	WATER-DRINKING	02/03/2012	02/06/2012
B2.01464G	HW28A-P	PA;DIMOCK	WATER-DRINKING	02/03/2012	02/06/2012
B2.01490J	HW40	PA:DIMOCK	WATER-DRINKING	02/02/2012	02/06/2012
B2.01491K	HW40-P	PA:DIMOCK	WATER-DRINKING	02/02/2012	02/06/2012
B2.01492L	HW39	PA:DIMOCK	WATER-DRINKING	02/03/2012	02/06/2012
B2.01493M	HW39-P	PA:DIMOCK	WATER-DRINKING	02/03/2012	02/06/2012
B2.01494N	FB10	PA:DIMOCK	WATER-DRINKING	02/03/2012	02/07/2012
B2.01495P	HW09	PA:DIMOCK	WATER-DRINKING	02/03/2012	02/07/2012
B2.01496Q	HW09-P	PA:DIMOCK	WATER-DRINKING	02/03/2012	02/07/2012
B2.01497R	HW28B-P	PA:DIMOCK	WATER-DRINKING	02/03/2012	02/07/2012

EXCEPTIONS

- 1. Packaging and shipping-No problems were observed.
- 2. Documentation-No problems were observed.
- 3. Sample preparation-No problems were encountered.
- 4. **Analysis** During counting, samples B2.01459, B2.01460, B2.01492, and B2.01493 had peaks that shifted from their normal region-of-interest (ROI) due to attenuation. The ROIs were manually adjusted, and the results are reported in this data package.
- 5. Holding times-No holding times were specified.

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QUALITY CONTROL

- 1. QC samples-All QC analysis results met NAREL acceptance criteria.
- 2. Yields-All chemical yields were within acceptance limits.
- Instruments—Response and background checks for all instruments used in these analyses met NAREL
 acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Director of the Center for Environmental Radioanalytical Laboratory Science and the NAREL Quality Assurance Manager, or their designees, as verified by the following signatures.

Mary F. Wisdom

Quality Assurance Manager, NAREL

Date

John G. Griggs, Ph.D.

John G. Griggs, Ph.D.

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John G. Griggs, Ph.D.

Director, Center for Environmental Radioanalytical

Laboratory Science

GENERAL INFORMATION

SAMPLE TYPES

BLD Blind sample FBK Field blank SAM Normal sample

ANALYSIS QC TYPES

ANA Normal analysis
DUP Laboratory duplicate

LCS Laboratory control sample (blank spike)

MS Matrix spike

MSD Matrix spike duplicate

RBK Method blank

QUALITY INDICATORS

RPD Relative Percent Difference

%R Percent Recovery

Z Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A method blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores." A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the Z score is computed.

Each standard uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

SDG #1100245

ANALYSIS SUMMARY

Analysis Procedure:

NAREL RA226-EICHROM

Title:

Radium-226 in Water: Rapid Method for High-Activity Samples

N. D. T. G I. (I	QC		Date	Assay	QC
NAREL Sample #	Туре	Preparation Procedure	Completed	Batch #	Batch #
B2.01332V		N/A	03/14/2012	0015801E	0008550C
B2.01333W		N/A	03/14/2012	0015801E	0008550C
B2.01455F	1	N/A	03/14/2012	0015801E	0008550C
B2.01456G		N/A	03/14/2012	0015801E	0008550C
B2.01457H		N/A	03/14/2012	0015801E	0008550C
B2.01458J		N/A	03/14/2012	0015801E	0008550C
B2.01459K		N/A	03/14/2012	0015801E	0008550C
B2.01460C		N/A	03/15/2012	0015807L	0008550C
B2.01461D		N/A	03/15/2012	0015807L	0008550C
B2.01462E		N/A	03/15/2012	0015807L	0008550C
B2.01462E	DUP	N/A	03/15/2012	0015807L	0008550C
B2.01463F		N/A	03/15/2012	0015807L	0008550C
B2.01464G		N/A	03/15/2012	0015807L	0008550C
B2.01490J		N/A	03/15/2012	0015807L	0008550C
B2.01491K		N/A	03/15/2012	0015807L	0008550C
B2.01492L		N/A	03/16/2012	0015810F	0008550C
B2.01493M		N/A	03/16/2012	0015810F	0008550C
B2.01494N		N/A	03/16/2012	0015810F	0008550C
B2.01495P		N/A	03/16/2012	0015810F	0008550C
B2.01496Q		N/A	03/16/2012	0015810F	0008550C
B2.01497R		N/A	03/16/2012	0015810F	0008550C
LCS-00633322K *	LCS	N/A	03/16/2012	0015810F	0008550C
RBK-00633321J*	RBK	N/A	03/14/2012	0015801E	0008550C

^{*} Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

PREPARATION METHOD(S) USED

Procedure ID	Title

Report: 1100245-RA226 - 4 - Original

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SAMPLE ANALYSIS REPORT

Sample #:

B2.01332V

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015801E

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L

Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight: Ash/dry weight:

N/A

Analyst: QC type: PH ANA

Sample description:

N/A N/A

Comment: Aqueous

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/13/2012 14:19	1000.0	AS33	GVJ

	<u></u>	± 2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	5.68e-02	8.8e-02	1.4e-01	PCI/L	03/12/2012 12:35 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01333W

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015801E

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L

Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight:

N/A

Analyst: QC type: PHANA

Ash/dry weight: Sample description: N/A N/A

Comment:

N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/13/2012 14:19	1000.0	AS34	GVJ

		± 2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	6.53e-02	8.3e-02	1.2e-01	PCI/L	03/12/2012 12:36 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #: Matrix: B2.01455F WATER-DRINKING QC batch #:

0008550C

Sample type:

SAM

Assay batch #:

0015801E N/A

Amount analyzed:

2.000e-01 L

Prep procedure:
Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight:

N/A N/A

Analyst: QC type: PH ANA

Ash/dry weight: Sample description: N/A N/A

Comment: N/A

COUNTING INFORMATION

	Date and time	Duration (min)	Detector ID	Operator
0	3/13/2012 14:19	1000.0	AS35	GVJ

		± 2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	6.78e-02	7.9e-02	1.0e-01	PCI/L	03/12/2012 12:45 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01456G

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015801E

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L

Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight:

N/A

Analyst:

PH

Ash/dry weight:

N/A N/A QC type:

ANA

Sample description: Comment:

N/A N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/13/2012 14:19	1000.0	AS36	GVJ

		±2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	5.88e-02	7.5e-02	1.1e-01	PCI/L	03/12/2012 13:04 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

Comment:

B2.01457H

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015801E

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L

Analysis procedure: Analyst:

NAREL RA226-EICHRO

Dry/wet weight:

N/A N/A

Analyst: QC type:

PH ANA

Ash/dry weight: Sample description:

N/A N/A

N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/13/2012 14:19	1000.0	AS37	GVJ

		±2σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	1.40e-01	1.1e-01	1.1e-01	PCI/L	03/12/2012 12:57 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01458J

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015801E

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L N/A

Analysis procedure: Analyst:

NAREL RA226-EICHRO PH

Dry/wet weight: Ash/dry weight:

N/A

QC type:

ANA

Sample description:

N/A

Comment:

Aqueous

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/13/2012 14:19	1000.0	AS38	GVJ

		± 2 σ			<u> </u>
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	-2.26e-02	5.8e-02	1.5e-01	PCI/L	03/12/2012 12:35 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01459K

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015801E

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L N/A Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight: Ash/dry weight:

N/A N/A Analyst: QC type:

PH ANA

Sample description: Comment: N/A N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/13/2012 14:19	1000.0	AS39	GVJ

		± 2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	1.45e+00	3.3e-01	6.7e-02	PCI/L	03/12/2012 12:49 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01460C

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015807L

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L N/A

Analysis procedure: Analyst:

NAREL RA226-EICHRO

Dry/wet weight: Ash/dry weight:

N/A

QC type:

PH ANA

Sample description: Comment:

N/A N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/14/2012 15:55	1000.0	AS33	GVJ

		±2σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226 *	1.80e+00	3.9e-01	1.4e-01	PCI/L	03/13/2012 12:14 CDT

^{*} An asterisk indicates a result that may be significantly under or overestimated

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01461D

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015807L

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L

Analysis procedure:

NAREL RA226-EICHRO

DIM0270211

Dry/wet weight:

N/A

Analyst:

 \mathbf{PH}

Ash/dry weight:

N/A N/A QC type:

ANA

Sample description: Comment:

N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/14/2012 15:55	1000.0	AS34	GVJ

		± 2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	4.81e-02	7.5e-02	1.2e-01	PCI/L	03/13/2012 12:04 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01462E

WATER-DRINKING

QC batch #: Assay batch #: 0008550C

Matrix: Sample type:

SAM

Assay batch #:

0015807L

Amount analyzed:

2.000e-01 L

Prep procedure:
Analysis procedure:

N/A

Dry/wet weight:

2.000e-0 N/A

Analyst:

NAREL RA226-EICHRO PH

Ash/dry weight:

N/A N/A

QC type:

ANA

Sample description:
Comment:

N/A N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/14/2012 15:55	1000.0	AS39	GVJ

		± 2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	8.79e-02	7.9e-02	6.3e-02	PCI/L	03/13/2012 12:16 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01462E

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015807L

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L N/A

Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight: Ash/dry weight:

N/A

Analyst: QC type: PH DUP

Sample description:

N/A

Comment:

N/A .

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/14/2012 15:55	1000.0	AS40	GVJ

		± 2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	6.09e-02	7.7e-02	1.1e-01	PCI/L	03/13/2012 12:13 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01463F

WATER-DRINKING

QC batch #: Assay batch #: 0008550C

Matrix: Sample type:

SAM

0015807L

Amount analyzed:

Prep procedure: Analysis procedure: N/A NAREL RA226-EICHRO

Dry/wet weight:

2.000e-01 L N/A

Analyst: QC type: PH ANA

Ash/dry weight: Sample description: N/A N/A

Comment: N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/14/2012 15:55	1000.0	AS42	GVJ

		±2σ		-	
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	7.00e-02	8.2e-02	1.1e-01	PCI/L	03/13/2012 11:59 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01464G

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015807L

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L N/A

Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight: Ash/dry weight:

N/A

Analyst: QC type: PHANA

Sample description: Comment:

N/A N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/14/2012 15:55	1000.0	AS43	GVJ

ANALYTICAL RESULTS

Analyte	Activity	±2 σ Uncertainty	MDC	Unit	Date
Ra226	1.95e-01	1.2e-01	9.6e-02	PCI/L	03/13/2012 11:57 CDT

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SAMPLE ANALYSIS REPORT

Sample #:

B2.01490J

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015807L

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L N/A

Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight: Ash/dry weight:

N/A

Analyst: QC type: PH ANA

Sample description:

N/A

Comment:

N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/14/2012 15:55	1000.0	AS44	GVJ

		± 2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	6.52e-02	7.4e-02	7.0e-02	PCI/L	03/13/2012 12:09 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01491K

WATER-DRINKING

Assay batch #:

QC batch #:

0008550C

Matrix: Sample type:

SAM

Prep procedure:

0015807L

Amount analyzed:

2.000e-01 L

Analysis procedure:

N/A NAREL RA226-EICHRO

Dry/wet weight:

N/A

Analyst:

PH

Ash/dry weight:

N/A N/A QC type:

ANA

Sample description: Comment:

N/A

COUNTING INFORMATION

	Date and time	Duration (min)	Detector ID	Operator
ſ	03/14/2012 15:55	1000.0	AS46	GVJ

ANALYTICAL RESULTS

Analyte	Activity	± 2 σ Uncertainty	MDC	Unit	Date
Ra226	2.09e-01	1.2e-01	7.0e-02	PCI/L	03/13/2012 12:02 CDT

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DIM0270199 DIM0270217

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01492L

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015810F

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L

Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight: Ash/dry weight:

N/A N/A

Analyst: QC type: PH ANA

Sample description: Comment:

N/A N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:51	1000.0	AS34	GVJ

ANALYTICAL RESULTS

1			± 2 σ			
1	Analyte	Activity	Uncertainty	MDC	Unit	Date
	Ra226 *	2.35e+00	4.5e-01	1.4e-01	PCI/L	03/14/2012 10:11 CDT

^{*} An asterisk indicates a result that may be significantly under or overestimated

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SAMPLE ANALYSIS REPORT

Sample #:

Comment:

B2.01493M

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015810F

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L

Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight:

N/A

Analyst: QC type: PH ANA

Ash/dry weight: Sample description: N/A N/A N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:51	1000.0	AS39	GVJ

ſ			± 2 σ			
1	Analyte	Activity	Uncertainty	MDC	Unit	Date
Ī	Ra226 *	2.24e+00	4.4e-01	7.3e-02	PCI/L	03/14/2012 10:11 CDT

^{*} An asterisk indicates a result that may be significantly under or overestimated

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01494N

TO.

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015810F

Sample type: Amount analyzed: SAM

Prep procedure:
Analysis procedure:

N/A

Dry/wet weight:

2.000e-01 L N/A

Analyst:

NAREL RA226-EICHRO PH

Ash/dry weight:

N/A N/A

QC type:

ANA

Sample description:

N/A

Comment:

Aqueous

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:51	1000.0	AS40	GVJ

		±2σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	1.54e-02	5.7e-02	1.1e-01	PCI/L	03/14/2012 09:58 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01495P

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015810F

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed: Dry/wet weight:

2.000e-01 L N/A

Analysis procedure: Analyst:

NAREL RA226-EICHRO

Ash/dry weight:

N/A N/A

QC type:

PH ANA

Sample description: Comment:

N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:51	1000.0	AS42	GVJ

		±2σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	8.48e-02	8.6e-02	1.0e-01	PCI/L	03/14/2012 10:05 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01496Q

QC batch #:

0008550C

Matrix:

WATER-DRINKING

Assay batch #:

0015810F

Sample type:

SAM

Prep procedure:

N/A

Amount analyzed:

2.000e-01 L N/A

Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight: Ash/dry weight:

N/A

Analyst: QC type: PH ANA

Sample description: Comment:

N/A N/A

COUNTING INFORMATION

	Date and time	Duration (min)	Detector ID	Operator
Γ	03/15/2012 15:51	1000.0	AS43	GVJ

		± 2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	1.79e-01	1.2e-01	9.6e-02	PCI/L	03/14/2012 10:02 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

B2.01497R

WATER-DRINKING

QC batch #: Assay batch #: 0008550C

Matrix: Sample type:

SAM

0015810F

Amount analyzed:

Prep procedure:

N/A

Dry/wet weight:

2.000e-01 L N/A

Analysis procedure: Analyst:

NAREL RA226-EICHRO PH

Ash/dry weight:

N/A N/A

ANA QC type:

Sample description:

Comment: N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:51	1000.0	AS44	GVJ

		± 2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	8.76e-02	8.7e-02	7.6e-02	PCI/L	03/14/2012 10:09 CDT

SDG #1100245

SAMPLE ANALYSIS REPORT

 Sample #:
 LCS-00633322K
 QC batch #:
 0008550C

 Matrix:
 N/A
 Assay batch #:
 0015810F

 Sample type:
 N/A
 Prep procedure:
 N/A

Sample type: N/A Prep procedure: N/A
Amount analyzed: 1.000e+00 SAMP Analysis procedure: NAREL RA226-EICHRO

Dry/wet weight: N/A Analyst: PH
Ash/dry weight: N/A QC type: LCS

Sample description: N/A Comment: N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/15/2012 15:51	03/15/2012 15:51 1000.0		GVJ

ANALYTICAL RESULTS

		± 2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	3.58e+00	4.0e-01	1.5e-02	PCI	03/14/2012 10:02 CDT

Report: 1100245-RA226 - 26 - Original

SDG #1100245

SAMPLE ANALYSIS REPORT

Sample #:

RBK-00633321J

QC batch #:

0008550C

Matrix:

N/A

Assay batch #:

0015801E

Sample type:

N/A

Prep procedure:

N/A

Amount analyzed:

1.000e+00 SAMP

Analysis procedure:

NAREL RA226-EICHRO

Dry/wet weight:

N/A

Analyst:

PH

Ash/dry weight:

N/A N/A QC type:

RBK

Sample description:

Comment: N/A

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/13/2012 14:19	1000.0	AS40	GVJ

		±2 σ			
Analyte	Activity	Uncertainty	MDC	Unit	Date
Ra226	2.26e-02	2.0e-02	2.3e-02	PCI	03/12/2012 12:36 CDT

SDG 1100245

QC BATCH SUMMARY

QC batch #:

0008550C

Preparation procedure:

N/A

Analysis procedure:

NAREL RA226-EICHROM

	QC			
NAREL Sample #	Туре	Yield (%)	± 2 σ Uncertainty (%)	Analyst
B2.01332V		84.10 %	8.21 %	PH
B2.01333W		83.49 %	8.01 %	PH
B2.01455F		90.15 %	8.54 %	PH
B2,01456G		92.52 %	8.59 %	PH
B2.01457H		84.79 %	8.26 %	PH
B2.01458J		84.68 %	8.24 %	PH
B2.01459K		86.86 %	8.19 %	PH
B2.01460C		87.79 %	8.44 %	PH
B2.01461D		85.02 %	8.08 %	PH
B2.01462E		91.36 %	8.42 %	PH
B2.01462E	DUP	89.00 %	8.31 %	PH
B2.01463F		87.00 %	8.29 %	PH
B2.01464G		83.90 %	8.09 %	PH
B2.01490J		87.47 %	8.38 %	PH
B2.01491K		92.52 %	8.82 %	PH
B2.01492L		82.64 %	7.93 %	PH
B2.01493M		79.50 %	7.69 %	PH
B2.01494N		88.02 %	8.22 %	PH
B2.01495P		88.41 %	8.37 %	PH
B2.01496Q		83.44 %	8.06 %	PH
B2.01497R		81.43 %	7.99 %	PH
LCS-00633322K *	LCS	80.40 %	7.90 %	PH
RBK-00633321J*	RBK	83.96 %	8.02 %	PH

^{*} Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory QC Batch Report

QC Batch #: 0008550C

Analytical Method: NAREL RA226-EICHROM

METHOD BLANKS (PCI)

Sample ID	Nuclide	Activity	± 2σ	Prep Date	Flags
00633321J	RA226	2.26e-02	± 2.0e-02	2012-03-12	OK

LABORATORY DUPLICATES (PCI/L)

Sample ID	Nuclide	Original ± 2σ	Duplicate ± 20	R₽D	Z
B2.01462E	RA226	8.79e-02 ± 7.9e-02	6.09e-02 ± 7.7e-02	36.34	-0.49 OK

LAB CONTROL SAMPLES (PCI)

Sample ID	Nuclide	Amt Added ± 20	Measured ± 2σ	₹R	Z
00633322K	RA226	3.37e+00 ± 3.4%	3.58e+00 ± 4.0e-01	106.46	1.04 OK

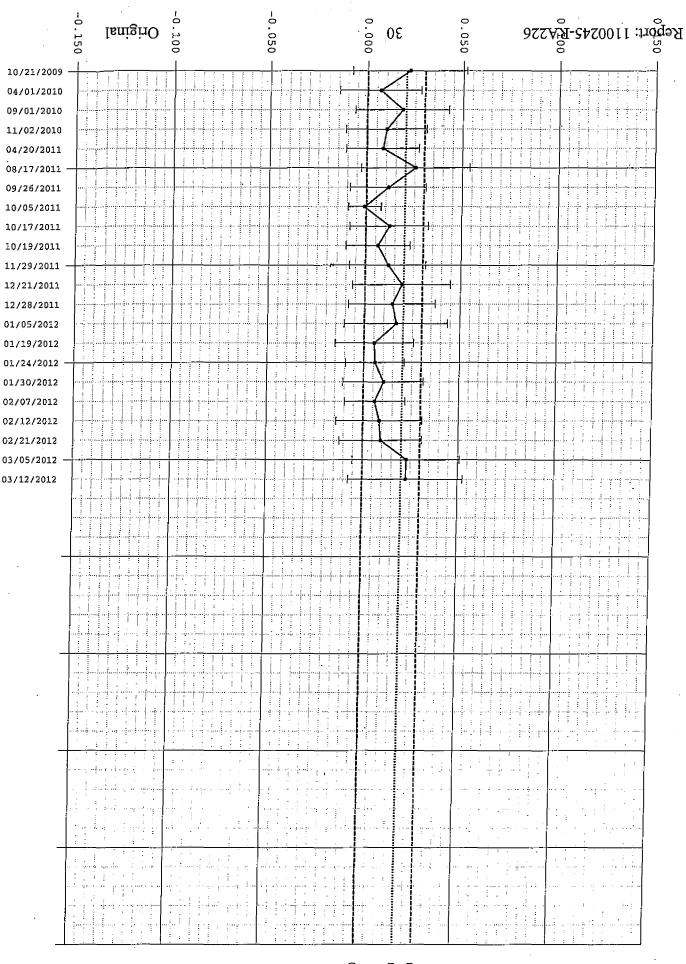
Analyst:

Report: 1100245-RA226

Analyst: Honsa, Patricia

Method: NAREL RA226-EICHROM

Method Blanks Analyte: RA226



0.030